IDENTIFYING SUBJECTIVE VALUE IN WOMEN'S COLLEGE GOLF RECRUITING REGARDLESS OF SOCIO-ECONOMIC CLASS

by

Victoria Allred

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Victoria Allred

Greenville, NC

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Approved by:

Dr. Christopher Carolan

Thomas Harriot College of Arts and Sciences: Department of Mathematics

Abstract

College athletics have grown into a major industry and athletic departments are pushing coaches to recruit the top talent. To recruit golfers, college coaches depend on multiple ranking systems. These systems are bias towards more expensive, national tournaments over inexpensive, state tournaments. In response, players who come from a lower socio-economic class will have fewer financial aid opportunities than someone from a higher economic class. Analyzing junior girls' golf statistics, has led to the creation of an objective methodology to compare golfers without regard to socio-economic imbalances.

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Introduction

College athletics have grown into a major industry. During the 2016-2017 school year, the National Collegiate Athletic Association, the organization that regulates collegiate sports, reported a $1,054,625,808 revenue (NCAA). Because of this, college coaches are pressured to find the best of the best.

College golf coaches use multiple ranking systems to recruit players. The most popular is Junior Golf Scoreboard. This is a national based system that ranks players based on their scoring averages and strength of field. The strength of field is determined by the amount of top ranked players in the tournament. However, these systems produce bias towards more expensive tournaments, such as American Junior Golf Association. The entry fee of the American Junior Golf Association is approximately three hundred and seventy-five dollars per tournament (AJGA). This does not include the cost of tour membership, travel, hotel, meals, and other expenditures a player may have in a week. A tournament fee for the Peggy Kirk Bell Girls Golf Tour, a Mid-Atlantic tour, is approximately two hundred dollars per tournament (Peggy Kirk Bell Girls Golf Tour Tournaments). Two players may have the same scoring average on Junior Golf Scoreboard but, if one travels and play in certain tournaments then he/she will have a better ranking than the other. Because of this, current ranking systems include an inherent socio-economic bias and does not accurately portray a junior golfer's full potential.

Data

There are many different factors that could affect how many strokes a golfer has during a round of golf. These factors include weather, player ability, their fairway percentage, their greens in regulation percentage, if they are making par when they miss the green, the number of putts they had, and many others.

The data was collected in the fall of 2016 to the fall of 2017 from the Peggy Kirk Bell Girls Golf Tour. The criteria for the data required a two-day tournament with players competing in either the Bell or the Prep divisions. Players playing in these divisions are being recruited to play college golf, therefore they are our target group. The statistics we analyzed are as follows: player, course differential, score, course slope, percentage of number of fairways hit, percentage of number of greens hit in regulation (GIRS), up and down percentage, number of putts, number of penalties, the temperature in Fahrenheit, and whether it rained. The rain variable is a dummy variable with 0 indicating no rain and 1 indicating rain.

Methodology

To collect the data, we had players enter their data on statistics cards during their eighteen-hole tournament round of golf (**Appendix A**). **Figure 1** is a sample of a scorecard a player received when they checked in to a tournament. **Figure 2** depicts the instructions on how to fill out the card. Once we obtained the data, we developed an algorithm to rank the golfers using SAS software. With SAS, we used the code in **Figure 3** to compute the parameter estimations, ANOVA table, and the R^2 variable. We then used Minitab to equalize the course difficulty. To create these variables, course differential and player were set as independent variables and an individual statistic, such as fairway, was set as a dependent variable. We did the same procedure to green in regulation, up and down percentage, number of putts, and number of penalties (**Appendix B**). These new variables were then inputted into the original equation, thus creating the ranking system (**Appendix C**).

Figure 1

Name:											Course:	Greenville CC					Bell				
Date:											Yardage:	6,020			Slope:		133				
Hole	1	2	3	4	5	6	7	8	9	OUT	10	11	12	13	14	15	16	17	18	IN	TOTAL
PAR	5	4	3	4	4	5	4	3	4	36	3	4	4	5	4	3	4	4	5	36	72
SCORE																					
FWY HIT			3					3			3					3					
GIRs																					
U/D																					
Sand U/D																					
1ST PUTT																					
PUTTS																					
Penalties																					

Figure 2

Statistic Card Instructions	
SCORE	The total score on the hole
FWY HIT	FAIRWAY HIT, if tee shot is in the fairway mark Y
	If you missed the fairway mark L-left and R-right.
GIRs	GREEN IN REGULATION, If you hit the green mark Y; inside 15 feet mark Y-15.
	If not, mark either S-Short, O-Long, R-Right, or L-Left.
U/D	UP AND DOWN (Yes, No, or N/A)
Sand U/D	SAND SAVE UP AND DOWN (Yes, No, or N/A)
1ST PUTT	Approximate length of 1st putt from the green
PUTTS	Total number of putts you have from the green
Penalties	Number of penalty strokes on the hole, if any

Figure 3

```
proc reg data=golf;
model score= Fairways   GIRS  UpDown      Putts Penalties   /clb;
run;
quit;
```

Results

The sample consists of 267 tournament rounds of golf with 115 participants (**Appendix A**). Initially, we started with the following variables: course differential, percentage of fairways, greens in regulations, up and down percentage, number of putts, number of penalties, temperature in Fahrenheit, and whether it rained. Each variable was tested for significance using a t-test (**Table 1**). The variables differential, temperature, and rain were not significant in computing the algorithm. Therefore, they were removed and the new parameter estimates are in **Table 2**.

Table 1

Parameter Estimates with Differential, Temperature, Rain							
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**95% Confidence Limits**	
Intercept	**1**	43.05850	12.94718	3.33	0.0010	17.56289	68.55411
Differential	**1**	0.25534	0.16844	1.52	0.1308	-0.07635	0.58702
Fairways	**1**	-1.67080	0.79412	-2.10	0.0363	-3.23457	-0.10702
GIRS	**1**	-23.01872	0.83163	-27.68	<.0001	-24.65636	-21.38107
UpDown	**1**	-1.70192	0.83895	-2.03	0.0435	-3.35399	-0.04986
Putts	**1**	0.94322	0.04870	19.37	<.0001	0.84731	1.03912
Penalties	**1**	0.96453	0.12282	7.85	<.0001	0.72268	1.20639
Temperature	**1**	-0.00515	0.01221	-0.42	0.6735	-0.02919	0.01889
Rain	**1**	0.25841	0.40648	0.64	0.5255	-0.54202	1.05885

Table 2

Parameter Estimates without Differential, Temperature, Rain							
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**	**95% Confidence Limits**	
Intercept	**1**	61.87501	1.80605	34.26	<.0001	58.31873	65.43130
Fairways	**1**	-1.99640	0.76177	-2.62	0.0093	-3.49641	-0.49640
GIRS	**1**	-22.63226	0.79218	-28.57	<.0001	-24.19214	-21.07238
UpDown	**1**	-1.64358	0.83578	-1.97	0.0503	-3.28932	0.00216
Putts	**1**	0.94482	0.04859	19.44	<.0001	0.84913	1.04051
Penalties	**1**	0.98427	0.11973	8.22	<.0001	0.74850	1.22004

The ANOVA table in **Table 3** uses the parameters from **Table 2**. The F-test is used to determine the significance of the overall equation. Since the F-value is 328.92, the p-value is less than 0.0001. This indicates that the equation is significant. The R^2 value in table 4 is 0.8630. This adds additional emphasis on the significance of the equation. Additionally, the fifth graph in **Figure 4** depicts the liner relationship of the predicted value and the actual score using each of the variables. Therefore, the algorithm is *Score= 61.87501-1.9964*Fairways-22.63226*GIRS-1.64358*UpDown+0.94482*Putts+0.98427*Penalties*.

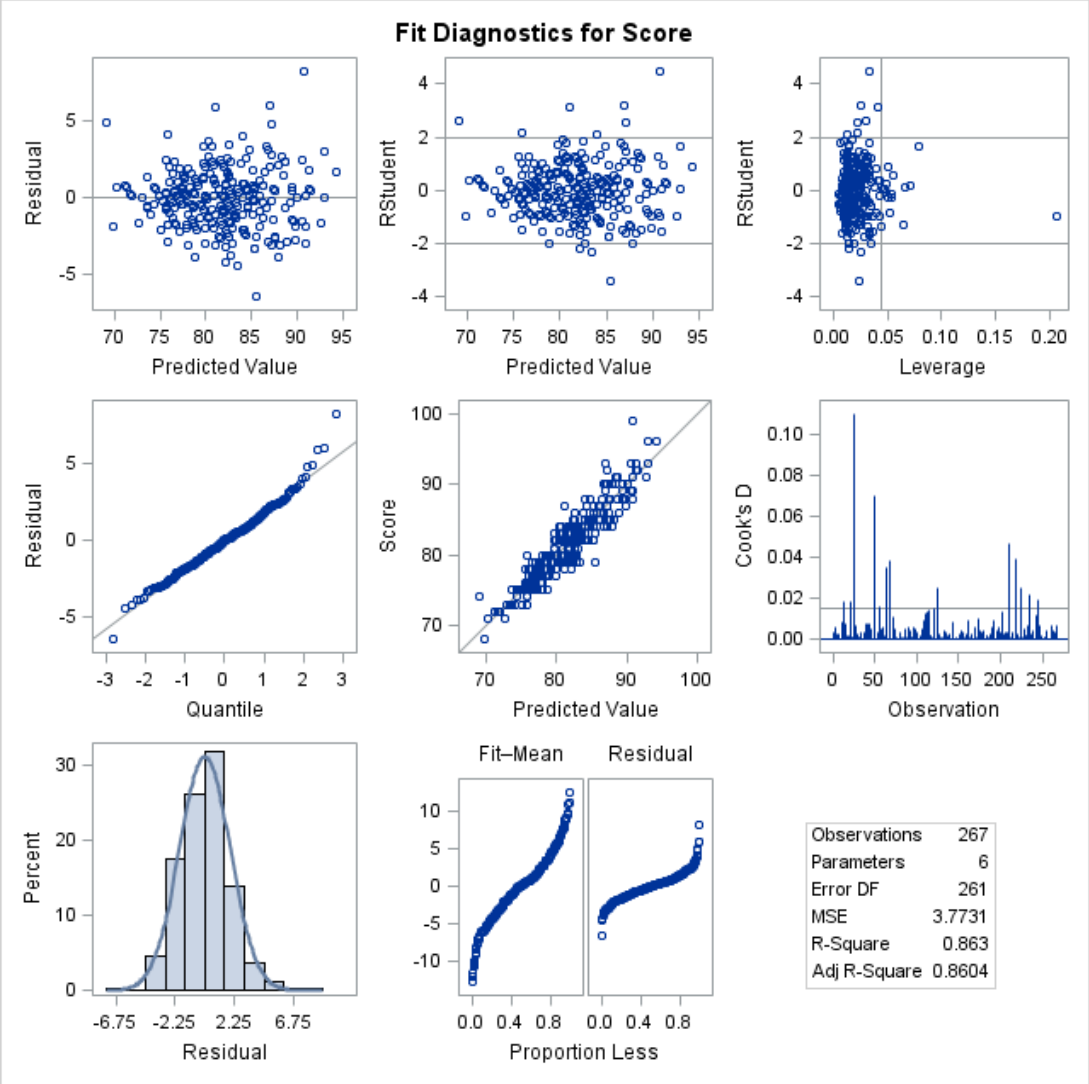
Table 3

Analysis of Variance without Differential, Temperature, Rain					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	5	6205.15759	1241.03152	328.92	<.0001
Error	261	984.77500	3.77308		
Corrected Total	266	7189.93258			

Table 4

R^2 Analysis without Differential, Temperature, Rain			
Root MSE	1.94244	R-Square	0.8630
Dependent Mean	81.71910	**Adj R-Sq**	0.8604
Coeff Var	2.37698		

Figure 4



Conclusion

This study will be used to develop an overall ranking and individual statistics rankings. The overall ranking will compute each of the different components together to make one ranking. The individual rankings will have the players ordered based on their scoring average, fairways hit, greens in regulation, and up and down percentage. By doing this, college coaches and players could see where they are weak or strong in their golf game and can use these percentages to better themselves. **Appendix C** models this system.

A few components that were missing in the analysis that could affect the algorithm was the inability to compute the sand up-and-down percentage and wind and the lack of influence from the following variables: temperature and rain. With the sand up-and-down percentage, not every subject filled out the statistics card the same. Regarding the weather, all of the tournaments were held in Virginia, North Carolina, South Carolina, or Georgia in the fall or the spring. This caused the temperatures to have very little variation. There was also minimum data on days where it rained and wind speed. I believe if the temperature had variation and there was data on rain and wind speed, then this would be significant for the equation.

This study will redefine the recruiting process for college golf coaches. They will be able to analyze players based on their playing ability, not solely on the types of tournaments in which they are playing. This will also redefine how a junior golfer analyzes their game and will help them improve in areas in which they may not have realized they were weak in. Currently, there is no other ranking system that ranks junior golfers solely on their statistics so we will be the first. The purpose of golf is to get the ball in the hole in the fewest number of strokes. This study analyzed players with this purpose in mind.

Appendix A

Peggy Kirk Bell Girls Golf Tour Tournament Data

Obs	Player	Differential	Score	Slope	Fairways	GIRS	UpDown	Putts	Penalties	Temperature	Rain
1	1	76.0	84	141	0.71	0.67	0.17	37	2	63	0
2	1	75.1	82	137	0.71	0.44	0.10	37	0	59	0
3	1	74.9	83	138	0.86	0.67	0.17	40	0	49	0
4	1	74.2	82	126	0.93	0.56	0.38	35	0	72	0
5	1	74.2	75	126	0.93	0.72	0.40	33	0	61	0
6	2	76.0	83	141	0.64	0.61	0.00	37	1	55	0
7	2	74.2	82	126	0.64	0.33	0.17	33	0	72	0
8	3	75.5	87	141	0.64	0.28	0.15	33	2	72	0
9	3	75.5	84	141	0.57	0.56	0.25	39	0	76	0
10	4	75.1	85	137	0.64	0.17	0.33	28	0	59	0
11	5	75.1	82	137	0.71	0.61	0.14	36	0	59	0
12	6	75.5	90	141	0.29	0.33	0.17	35	0	76	0
13	7	74.2	88	126	0.36	0.22	0.14	37	0	72	0
14	7	74.2	90	126	0.86	0.33	0.08	38	0	61	0
15	7	74.8	96	134	0.64	0.39	0.09	42	3	67	1
16	8	76.0	82	141	1.00	0.56	0.00	38	0	55	0
17	8	75.2	75	133	0.71	0.50	0.33	29	0	88	0
18	8	75.2	86	133	0.79	0.56	0.13	39	1	59	1
19	9	74.8	88	134	0.64	0.39	0.18	38	2	67	1
20	9	74.8	82	134	0.71	0.44	0.20	34	2	77	0
21	10	76.0	80	141	0.86	0.44	0.50	28	0	55	0
22	11	76.0	75	141	0.64	0.61	0.43	32	0	55	0
23	11	76.0	72	141	0.93	0.61	0.86	28	0	63	0
24	12	75.1	99	137	0.43	0.17	0.27	36	0	59	0
25	12	74.9	88	138	0.50	0.22	0.21	35	0	49	0
26	12	74.9	90	138	0.57	0.33	0.25	36	0	47	1
27	12	74.2	89	126	0.86	0.33	0.17	39	0	72	0
28	13	76.0	85	141	0.64	0.56	0.13	40	2	55	0
29	13	75.1	85	137	0.57	0.56	0.25	39	0	59	0
30	13	74.9	79	138	0.50	0.67	0.17	34	0	49	0
31	13	74.9	75	138	0.57	0.89	0.00	37	0	47	1
32	13	74.2	82	126	0.86	0.44	0.30	32	3	72	0
33	13	74.2	79	126	0.79	0.56	0.63	34	0	61	0
34	13	75.5	77	141	0.57	0.56	0.13	33	0	72	0
35	13	75.5	82	141	0.57	0.50	0.22	36	0	76	0
36	13	75.2	82	133	0.57	0.33	0.42	32	0	88	0
37	13	75.2	83	133	0.71	0.39	0.36	31	0	59	1
38	14	75.1	78	137	0.50	0.67	0.33	33	0	59	0
39	15	73.1	84	132	0.86	0.39	0.27	38	0	62	1
40	16	76.0	77	141	0.43	0.67	0.33	33	0	55	0
41	16	75.2	78	133	0.79	0.39	0.36	32	0	88	0
42	16	75.2	80	133	0.79	0.61	0.00	36	2	59	1
43	17	75.5	83	134	0.50	0.61	0.29	35	0	76	0
44	18	75.1	76	137	0.57	0.56	0.63	31	0	59	0
45	19	76.0	86	141	0.57	0.39	0.36	33	0	55	0
46	20	75.3	72	133	0.93	0.89	0.50	34	0	81	0
47	21	73.1	78	132	0.93	0.56	0.50	33	0	61	0
48	21	73.1	79	132	0.79	0.50	0.44	33	0	62	1
49	22	75.5	93	141	0.50	0.56	0.00	40	1	72	0
50	22	75.5	87	141	0.79	0.39	0.45	29	3	76	0
51	22	74.8	85	134	0.57	0.39	0.36	34	1	67	1
52	22	74.8	77	134	0.71	0.67	0.33	33	0	77	0
53	23	73.1	90	132	0.71	0.28	0.15	36	0	61	0
54	23	73.1	81	132	0.64	0.33	0.33	31	0	62	1
55	24	75.5	79	141	0.36	0.33	0.50	30	1	72	0
56	24	75.5	75	141	0.86	0.72	0.20	35	0	76	0
57	25	75.5	84	141	0.93	0.22	0.29	30	0	76	0
58	26	76.0	86	141	0.64	0.33	0.17	36	2	55	0
59	26	76.0	82	141	0.86	0.67	0.00	37	0	63	0

60	26	74.2	78	126	0.93	0.72	0.20	36	0	72	0
61	26	75.2	84	133	0.86	0.44	0.20	34	0	59	1
62	26	75.3	87	133	0.71	0.44	0.20	35	3	81	0
63	26	75.3	78	133	0.93	0.78	0.50	36	0	63	0
64	27	76.0	74	141	0.79	0.78	0.60	29	0	55	0
65	27	76.0	72	141	1.00	0.61	1.00	29	0	63	0
66	28	75.3	81	133	0.64	0.44	0.57	33	0	81	0
67	29	75.3	96	133	0.71	0.28	0.08	36	5	81	0
68	29	75.3	83	133	0.50	0.39	0.45	31	0	63	0
69	30	76.0	80	141	0.57	0.50	0.33	33	0	63	0
70	30	73.1	75	132	0.93	0.44	0.70	27	0	61	0
71	30	75.5	85	141	0.86	0.33	0.25	34	0	72	0
72	31	73.1	84	132	0.43	0.50	0.33	33	0	62	1
73	31	74.2	81	126	0.64	0.33	0.25	32	0	72	0
74	32	76.0	88	141	0.57	0.33	0.25	36	3	55	0
75	32	75.2	81	133	0.57	0.44	0.20	31	0	59	1
76	33	76.0	78	141	0.71	0.67	0.33	35	0	55	0
77	33	76.0	78	141	0.79	0.72	0.20	37	0	63	0
78	33	75.1	77	137	0.93	0.67	0.33	35	0	59	0
79	33	74.9	74	138	0.57	0.78	0.25	35	0	49	0
80	33	74.9	75	138	0.64	0.67	0.50	32	0	47	1
81	33	74.2	82	126	0.86	0.50	0.33	35	2	72	0
82	33	74.2	76	126	0.86	0.61	0.57	33	0	61	0
83	33	75.2	78	133	0.57	0.67	0.17	36	0	88	0
84	33	75.3	72	133	0.79	1.00	0.00	36	0	81	0
85	33	75.3	73	133	0.50	0.72	0.80	32	0	63	0
86	34	73.1	75	132	0.79	0.44	0.40	30	0	61	0
87	34	73.1	82	132	0.71	0.28	0.15	32	0	62	1
88	35	75.1	85	137	0.79	0.39	0.18	35	1	59	0
89	36	74.2	83	126	1.00	0.50	0.33	35	1	72	0
90	37	75.5	87	141	0.71	0.33	0.08	37	2	72	0
91	38	76.0	88	141	0.79	0.33	0.17	36	1	55	0
92	39	76.0	90	141	0.71	0.33	0.25	38	1	55	0
93	39	76.0	78	141	1.00	0.50	0.56	30	0	63	0
94	39	75.1	81	137	0.64	0.61	0.14	35	0	59	0
95	40	76.0	81	141	0.50	0.44	0.30	34	0	55	0
96	40	76.0	85	141	0.71	0.50	0.11	34	3	63	0
97	40	74.2	77	126	0.43	0.50	0.67	31	1	72	0
98	40	74.2	80	126	1.00	0.83	0.33	39	1	61	0
99	40	74.8	75	134	0.86	0.61	0.29	31	0	77	0
100	40	75.2	73	133	0.86	0.61	0.43	29	1	88	0
101	40	75.2	79	133	0.57	0.39	0.36	31	1	59	1
102	41	76.0	75	141	0.86	0.61	0.57	31	1	55	0
103	42	75.1	91	137	0.64	0.28	0.15	39	0	59	0
104	43	75.3	78	133	0.71	0.78	0.50	37	0	81	0
105	44	74.9	84	138	0.86	0.39	0.27	35	0	49	0
106	44	74.2	91	126	0.64	0.17	0.20	33	1	72	0
107	44	74.2	85	126	0.86	0.17	0.40	32	0	61	0
108	44	75.5	91	141	0.79	0.33	0.08	36	2	72	0
109	44	75.5	93	141	0.64	0.33	0.25	40	0	76	0
110	45	74.2	79	126	0.86	0.56	0.38	38	0	72	0
111	45	75.5	85	141	0.64	0.44	0.30	37	0	76	0
112	46	76.0	84	141	0.64	0.56	0.13	38	1	55	0
113	46	75.2	77	133	0.36	0.39	0.45	29	1	88	0
114	47	76.0	86	141	0.79	0.44	0.00	38	0	55	0
115	47	75.1	82	137	0.86	0.56	0.00	40	0	59	0
116	47	75.3	79	133	0.79	0.56	0.10	34	1	81	0
117	48	74.2	84	126	0.86	0.44	0.20	37	1	72	0
118	48	74.2	77	126	0.57	0.56	0.38	32	1	61	0
119	48	75.5	82	141	0.57	0.50	0.22	36	0	72	0
120	48	75.5	85	141	0.43	0.50	0.22	40	1	76	0
121	48	74.8	89	134	0.57	0.44	0.40	39	0	67	1
122	49	76.0	79	141	0.79	0.50	0.33	32	0	55	0
123	50	76.0	83	141	0.64	0.44	0.30	34	1	55	0
124	50	75.2	75	133	0.36	0.39	0.55	29	0	88	0
125	51	75.1	80	137	0.71	0.33	0.33	31	0	59	0

126	51	73.1	80	132	0.79	0.44	0.50	33	0	61	0
127	51	73.1	79	132	0.79	0.50	0.11	34	0	62	1
128	51	74.9	77	138	0.79	0.61	0.86	34	0	49	0
129	51	74.2	85	126	0.71	0.28	0.15	32	0	72	0
130	51	74.2	82	126	0.79	0.44	0.20	33	2	61	0
131	51	75.5	83	141	0.64	0.50	0.11	34	1	72	0
132	51	75.5	79	141	0.57	0.33	0.25	29	0	76	0
133	51	75.2	80	133	0.57	0.56	0.13	32	0	88	0
134	52	73.1	79	132	0.71	0.56	0.38	35	0	61	0
135	52	73.1	79	132	0.86	0.67	0.33	34	0	62	1
136	53	75.1	84	137	0.50	0.39	0.45	34	0	59	0
137	54	76.0	75	141	0.71	0.78	0.25	33	0	55	0
138	55	76.0	75	141	0.79	0.44	0.60	29	0	55	0
139	55	73.1	77	132	0.93	0.50	0.56	32	0	61	0
140	56	76.0	87	141	0.57	0.44	0.30	37	1	55	0
141	56	76.0	81	141	0.57	0.56	0.38	35	1	63	0
142	57	75.1	90	137	0.57	0.22	0.43	34	0	59	0
143	57	73.1	85	132	0.79	0.39	0.18	33	0	61	0
144	58	76.0	75	141	0.71	0.50	0.56	29	0	55	0
145	58	76.0	79	141	0.64	0.67	0.17	34	1	63	0
146	58	76.0	71	141	1.00	0.78	0.75	31	0	62	0
147	58	75.1	76	137	0.86	0.78	0.50	36	0	59	0
148	59	74.2	83	126	0.71	0.44	0.30	35	1	72	0
149	59	74.2	76	126	0.86	0.61	0.29	32	0	61	0
150	60	75.5	82	141	0.57	0.61	0.33	38	0	76	0
151	61	75.5	80	141	0.71	0.44	0.40	31	0	76	0
152	62	74.2	77	126	0.57	0.39	0.55	28	1	72	0
153	63	75.5	93	141	0.71	0.39	0.09	41	1	72	0
154	63	75.5	86	141	0.71	0.50	0.11	39	0	76	0
155	64	74.2	82	126	0.71	0.33	0.42	34	0	72	0
156	64	74.2	88	126	0.79	0.33	0.17	37	0	61	0
157	64	75.5	85	141	0.79	0.39	0.08	37	0	72	0
158	64	75.5	81	141	0.57	0.50	0.33	35	0	76	0
159	64	74.8	81	134	0.79	0.67	0.17	40	0	67	1
160	64	74.8	81	134	0.79	0.56	0.00	34	2	77	0
161	65	73.1	82	132	0.79	0.61	0.29	38	0	61	0
162	65	73.1	88	132	0.64	0.44	0.40	36	0	62	1
163	66	74.2	84	126	0.71	0.22	0.36	32	0	72	0
164	67	75.5	78	141	0.79	0.67	0.50	35	0	72	0
165	67	75.5	79	141	0.43	0.67	0.17	34	0	76	0
166	68	74.2	86	126	0.86	0.44	0.30	38	1	72	0
167	69	75.5	88	141	0.43	0.28	0.23	35	0	72	0
168	69	75.5	85	141	0.50	0.28	0.23	32	0	76	0
169	70	75.3	75	133	0.86	0.56	0.38	30	2	81	0
170	70	75.3	85	133	0.64	0.50	0.11	34	4	63	0
171	71	76.0	76	141	0.86	0.61	0.43	34	0	55	0
172	71	76.0	80	141	0.71	0.72	0.20	36	2	63	0
173	71	76.0	75	141	0.86	0.67	0.83	32	1	62	0
174	72	75.1	84	137	0.50	0.39	0.09	37	1	59	0
175	72	75.5	88	141	0.36	0.50	0.00	41	1	72	0
176	72	75.5	79	141	0.36	0.61	0.43	35	0	76	0
177	73	74.2	90	126	0.79	0.33	0.25	37	2	72	0
178	74	74.9	87	138	0.79	0.22	0.21	32	0	49	0
179	75	75.1	92	137	0.57	0.22	0.21	37	1	59	0
180	75	74.2	84	126	0.71	0.17	0.47	28	0	72	0
181	75	74.2	83	126	0.86	0.33	0.58	32	1	61	0
182	76	76.0	82	141	0.64	0.44	0.30	31	2	55	0
183	77	75.1	76	137	0.93	0.56	0.38	33	0	59	0
184	77	74.9	82	138	0.50	0.28	0.31	31	0	49	0
185	77	75.5	87	141	0.64	0.28	0.31	34	0	72	0
186	77	75.5	78	141	0.86	0.56	0.25	32	0	76	0
187	78	74.9	84	138	0.64	0.61	0.14	36	1	49	0
188	78	74.2	86	126	0.71	0.17	0.27	33	0	72	0
189	79	76.0	86	141	0.79	0.44	0.40	35	1	55	0
190	79	74.2	89	126	0.93	0.39	0.27	39	3	72	0
191	79	75.5	91	141	0.93	0.33	0.08	38	0	72	0

192	79	75.5	88	141	0.71	0.44	0.09	36	2	76	0
193	80	76.0	75	141	0.86	0.56	0.50	31	0	55	0
194	80	74.8	77	134	0.43	0.61	0.57	33	0	67	1
195	80	74.8	73	134	0.86	0.61	0.43	32	0	77	0
196	81	75.2	78	133	0.57	0.50	0.11	31	0	88	0
197	81	75.2	83	133	0.50	0.44	0.20	30	2	59	1
198	82	76.0	81	141	0.71	0.56	0.13	34	0	55	0
199	83	75.3	84	133	0.93	0.44	0.30	34	0	81	0
200	83	75.3	86	133	0.79	0.33	0.33	35	0	63	0
201	84	75.3	83	133	0.50	0.67	0.00	39	3	81	0
202	84	75.3	82	133	0.50	0.61	0.14	36	0	63	0
203	85	76.0	73	141	0.93	0.61	0.57	30	0	55	0
204	86	75.5	77	141	0.86	0.72	0.20	35	2	72	0
205	87	74.8	84	134	0.71	0.50	0.44	33	1	77	0
206	87	75.2	79	133	0.86	0.50	0.33	33	0	88	0
207	87	75.2	79	133	0.93	0.67	0.50	35	0	59	1
208	87	75.3	79	133	0.79	0.67	0.33	35	0	81	0
209	88	75.1	81	137	0.79	0.50	0.11	35	0	59	0
210	89	76.0	85	141	0.86	0.39	0.36	39	0	55	0
211	89	74.9	79	138	0.43	0.50	0.11	38	0	49	0
212	90	76.0	82	141	0.50	0.39	0.36	31	0	55	0
213	90	74.9	82	138	0.50	0.56	0.38	37	0	49	0
214	90	75.2	84	133	0.50	0.56	0.25	33	4	88	0
215	91	75.1	81	137	0.64	0.61	0.14	37	0	59	0
216	91	74.9	76	138	0.64	0.61	0.29	30	1	49	0
217	91	74.9	75	138	0.64	0.67	0.50	32	0	47	1
218	91	75.5	91	141	0.64	0.56	0.00	39	8	72	0
219	91	75.5	81	141	0.79	0.39	0.55	31	2	76	0
220	91	75.3	80	133	0.50	0.50	0.33	35	0	81	0
221	92	75.1	80	137	1.00	0.39	0.27	30	0	59	0
222	93	75.3	82	133	0.79	0.67	0.00	36	2	81	0
223	94	74.2	92	126	0.93	0.06	0.13	35	0	72	0
224	94	74.2	92	126	0.71	0.28	0.08	33	2	61	0
225	95	73.1	80	132	0.93	0.22	0.29	30	0	61	0
226	95	73.1	81	132	0.86	0.22	0.43	29	0	62	1
227	96	76.0	77	141	0.86	0.61	0.43	33	0	55	0
228	97	74.9	80	138	0.43	0.33	0.33	31	0	49	0
229	97	74.9	73	138	0.64	0.67	0.50	30	0	47	1
230	98	75.5	78	141	0.79	0.44	0.40	31	1	72	0
231	99	75.5	84	141	0.57	0.39	0.36	31	2	72	0
232	99	75.5	84	141	0.29	0.50	0.33	35	0	76	0
233	100	74.9	88	138	0.57	0.39	0.09	35	0	49	0
234	100	74.9	79	138	0.57	0.33	0.08	32	0	47	1
235	101	76.0	80	141	0.64	0.61	0.57	35	0	55	0
236	101	75.5	83	141	0.57	0.50	0.00	35	1	72	0
237	101	75.5	73	141	0.64	0.67	0.40	32	0	76	0
238	102	74.2	82	126	0.64	0.33	0.25	30	0	72	0
239	102	75.5	87	141	0.57	0.44	0.30	34	2	72	0
240	102	75.5	82	141	0.57	0.50	0.33	35	0	76	0
241	103	74.8	84	134	0.71	0.50	0.33	35	2	77	0
242	104	76.0	78	141	0.93	0.50	0.33	36	0	55	0
243	104	74.2	79	126	1.00	0.50	0.22	34	0	72	0
244	105	76.0	80	141	0.64	0.61	0.14	32	2	55	0
245	105	76.0	79	141	0.36	0.33	0.42	27	3	63	0
246	105	76.0	82	141	0.57	0.67	0.50	35	2	62	0
247	105	75.5	78	141	0.64	0.50	0.67	32	0	76	0
248	106	76.0	84	141	0.64	0.44	0.30	32	2	55	0
249	106	76.0	90	141	0.43	0.17	0.20	33	2	63	0
250	107	75.1	80	137	0.71	0.44	0.40	33	0	59	0
251	107	73.1	82	132	0.93	0.39	0.36	32	1	61	0
252	107	73.1	80	132	0.86	0.50	0.22	35	0	62	1
253	107	74.9	81	138	0.79	0.50	0.33	35	1	49	0
254	108	75.3	89	133	0.79	0.22	0.29	36	2	81	0
255	109	75.1	85	137	0.43	0.22	0.36	29	2	59	0
256	110	76.0	80	141	0.71	0.61	0.43	35	1	55	0
257	110	76.0	74	141	0.86	0.56	0.88	30	0	63	0

258	111	76.0	78	141	0.86	0.61	0.57	33	1	63	0
259	112	73.1	93	132	0.93	0.17	0.07	39	0	61	0
260	112	73.1	82	132	0.71	0.33	0.42	32	0	62	1
261	113	76.0	84	141	0.71	0.39	0.27	38	0	55	0
262	114	76.0	83	141	0.71	0.67	0.33	38	0	55	0
263	114	74.9	71	138	0.79	0.67	0.50	30	0	49	0
264	114	74.9	74	138	0.71	0.61	0.71	31	1	47	1
265	114	75.5	86	141	0.79	0.44	0.10	37	0	72	0
266	114	75.5	77	141	0.71	0.67	0.50	34	0	76	0
267	115	75.5	68	141	1.00	0.83	0.33	31	0	76	0

Appendix B

Modified Data								
Obs	**Player**	**Overall**	**DifferentialFit**	**PuttsFit**	**FairwayFits**	**GIRFits**	**UpAndDownFits**	**PenaltiesFit**
1	1	80.9289	75	36.5061	0.82170	0.61063	0.23532	0.41585
2	2	83.2022	75	34.9116	0.64858	0.47263	0.08863	0.48679
3	3	85.2697	75	35.5580	0.63577	0.41869	0.22839	0.93394
4	4	82.6009	75	27.9116	0.64858	0.16707	0.33863	-0.01321
5	5	80.2711	75	35.9116	0.72001	0.61152	0.14815	-0.01321
6	6	85.9263	75	34.5580	0.31435	0.33535	0.19313	-0.06606
7	7	91.9275	75	39.5304	0.58469	0.31239	0.07394	1.07927
8	8	80.9305	75	34.9208	0.86006	0.53892	0.17748	0.27168
9	9	87.0101	75	36.1768	0.66712	0.41586	0.18032	2.02642
10	10	74.4802	75	27.1160	0.91441	0.44848	0.55293	-0.13212
11	11	72.5056	75	29.1160	0.84298	0.61515	0.69579	-0.13212
12	12	89.1263	75	36.6989	0.57640	0.26298	0.21250	0.02973
13	13	81.1413	75	34.7381	0.63972	0.54473	0.26312	0.49075
14	14	76.2940	75	32.9116	0.50573	0.66707	0.33863	-0.01321
15	15	89.2075	75	39.6796	0.74834	0.38121	0.17216	0.25102
16	16	79.4668	75	33.2541	0.69339	0.55744	0.25702	0.60501
17	17	79.0161	75	34.5580	0.52863	0.61313	0.31218	-0.06606
18	18	76.2971	75	30.9116	0.57715	0.55596	0.63029	-0.01321
19	19	81.2561	75	32.1160	0.62869	0.39293	0.41657	-0.13212
20	20	70.8283	75	33.7348	0.94575	0.89010	0.51588	-0.03964
21	21	81.0122	75	34.6796	0.74834	0.52010	0.37166	0.25102
22	22	81.9678	75	33.8674	0.65145	0.50061	0.29582	1.23018
23	23	87.2463	75	35.1796	0.56977	0.29788	0.14302	0.25102
24	24	78.7126	75	32.0580	0.63577	0.52980	0.37646	0.43394
25	25	82.2378	75	29.5580	0.95720	0.22424	0.31218	-0.06606
26	26	81.2046	75	35.3720	0.84052	0.56616	0.22875	0.78929
27	27	69.2025	75	28.1160	0.95012	0.69848	0.85293	-0.13212
28	28	80.3953	75	32.7348	0.66004	0.44566	0.58731	-0.03964
29	29	86.4168	75	33.2348	0.62432	0.33455	0.28161	2.46036
30	30	79.7358	75	31.4512	0.77808	0.42539	0.42072	0.01762
31	31	83.3010	75	33.6934	0.45841	0.41121	0.22021	0.17836
32	32	83.9360	75	32.9696	0.60579	0.39131	0.25676	1.42073
33	33	76.7681	75	34.5028	0.72773	0.70044	0.35463	0.18547
34	34	83.4295	75	32.6796	0.64120	0.35344	0.17636	0.25102
35	35	85.1333	75	34.9116	0.79144	0.38929	0.18711	0.98679
36	36	83.0740	75	35.7072	0.95419	0.49677	0.29099	1.10569
37	37	89.0658	75	36.5580	0.74292	0.33535	0.10980	1.93394
38	38	86.2282	75	35.1160	0.84298	0.33737	0.21960	0.86788
39	39	80.7761	75	33.7145	0.82580	0.48431	0.35319	0.24085
40	40	79.0970	75	32.6385	0.70899	0.55590	0.36011	0.98868
41	41	74.4095	75	30.1160	0.91441	0.61515	0.62436	0.86788
42	42	90.7742	75	38.9116	0.64858	0.27818	0.15914	-0.01321
43	43	76.6053	75	36.7348	0.73146	0.77899	0.51588	-0.03964
44	44	87.7046	75	35.3238	0.74913	0.27721	0.23380	0.61850
45	45	84.1263	75	37.6326	0.74141	0.49939	0.32956	0.01982
46	46	81.5940	75	32.9696	0.53436	0.47465	0.32153	0.92073
47	47	83.4831	75	36.9208	0.83625	0.52040	0.05803	0.27168

48	48	84.7071	75	36.9414	0.59084	0.48824	0.27542	0.62114
49	49	77.4186	75	31.1160	0.84298	0.50404	0.38626	-0.13212
50	50	80.2511	75	30.9696	0.53436	0.41909	0.45449	0.42073
51	51	81.4930	75	32.8570	0.67963	0.44256	0.26880	0.39499
52	52	80.8800	75	36.1796	0.67691	0.60344	0.25360	0.25102
53	53	83.3264	75	33.9116	0.50573	0.38929	0.45984	-0.01321
54	54	72.3563	75	32.1160	0.77155	0.78182	0.30293	-0.13212
55	55	77.9099	75	30.8978	0.83137	0.47040	0.55396	0.05945
56	56	82.6031	75	35.1160	0.62869	0.50404	0.39043	0.86788
57	57	85.8870	75	34.2956	0.62703	0.30192	0.25756	0.11891
58	58	74.0356	75	31.8149	0.84795	0.68369	0.53408	0.14761
59	59	81.0303	75	34.2072	0.73990	0.52455	0.25051	0.60569
60	60	81.6297	75	37.5580	0.60006	0.61313	0.35980	-0.06606
61	61	78.3932	75	30.5580	0.74292	0.44646	0.42646	-0.06606
62	62	79.4819	75	28.7072	0.52562	0.38566	0.50311	1.10569
63	63	87.8801	75	39.5580	0.74292	0.44646	0.12747	0.43394
64	64	84.3127	75	36.3140	0.72855	0.46229	0.18562	0.35535
65	65	85.2893	75	38.6796	0.60548	0.52010	0.24229	0.25102
66	66	86.0733	75	32.7072	0.66847	0.21899	0.31480	0.10569
67	67	76.9942	75	34.0580	0.63577	0.66869	0.35980	-0.06606
68	68	87.5058	75	38.7072	0.81133	0.44121	0.25766	1.10569
69	69	85.3045	75	33.0580	0.49292	0.27980	0.25723	-0.06606
70	70	80.8431	75	31.7348	0.76718	0.52899	0.25893	2.96036
71	71	76.2199	75	33.1160	0.86679	0.67071	0.54023	0.86788
72	72	85.2493	75	37.3425	0.42576	0.50148	0.19257	0.61822
73	73	90.2847	75	37.7072	0.73990	0.33010	0.20766	2.10569
74	74	85.2849	75	32.0884	0.77999	0.22182	0.20899	0.01321
75	75	86.1422	75	32.7753	0.68565	0.23872	0.39496	0.73273
76	76	80.0397	75	30.1160	0.70012	0.44848	0.35293	1.86788
77	77	80.8657	75	32.2790	0.74646	0.41768	0.32333	-0.03303
78	78	85.0369	75	34.8978	0.65280	0.38707	0.18094	0.55945
79	79	86.7930	75	36.7348	0.85646	0.40399	0.22762	1.46036
80	80	76.1981	75	31.8232	0.72574	0.59340	0.51059	-0.02642
81	81	79.4121	75	30.3232	0.54717	0.47303	0.16614	0.97358
82	82	78.5359	75	33.1160	0.77155	0.55960	0.17793	-0.13212
83	83	83.0608	75	34.2348	0.87432	0.39010	0.33255	-0.03964
84	84	82.8297	75	37.2348	0.51718	0.64010	0.08731	1.46036
85	85	72.3378	75	29.1160	0.98584	0.61515	0.62436	-0.13212
86	86	77.8978	75	34.5580	0.88577	0.72424	0.22646	1.93394
87	87	78.5837	75	33.8895	0.82859	0.58384	0.40939	0.23349
88	88	81.7506	75	34.9116	0.79144	0.50040	0.11640	-0.01321
89	89	85.9521	75	38.1022	0.66863	0.44626	0.26119	-0.05945
90	90	81.6791	75	33.3425	0.52100	0.50148	0.34895	1.28489
91	91	81.1998	75	33.8232	0.65431	0.55636	0.31181	1.80691
92	92	78.8477	75	29.9116	1.00573	0.38929	0.27802	-0.01321
93	93	80.8229	75	35.7348	0.80289	0.66788	0.01588	1.96036
94	94	90.4117	75	34.7072	0.77562	0.16343	0.05862	1.10569
95	95	84.7386	75	31.1796	0.78406	0.21455	0.25658	0.25102
96	96	75.5496	75	32.1160	0.91441	0.61515	0.48150	-0.13212
97	97	77.7474	75	30.5884	0.52999	0.49960	0.41137	0.01321
98	98	79.2349	75	30.5580	0.81435	0.44646	0.42646	0.93394
99	99	81.9222	75	32.5580	0.45720	0.44646	0.37495	0.93394
100	100	84.1955	75	33.5884	0.56570	0.36071	0.08183	0.01321
101	101	78.3085	75	33.4107	0.65722	0.59529	0.35910	0.24525
102	102	82.3144	75	32.9411	0.59906	0.42620	0.29797	0.65786
103	103	83.8739	75	35.1768	0.70283	0.49919	0.32275	2.02642
104	104	81.1201	75	34.9116	0.97001	0.50040	0.28307	-0.01321
105	105	78.4993	75	30.7265	0.60368	0.53131	0.47786	1.63440
106	106	84.8964	75	31.6160	0.59298	0.30960	0.30293	1.86788
107	107	82.8949	75	34.5898	0.76703	0.45450	0.27951	0.62551
108	108	90.4121	75	35.7348	0.80289	0.22343	0.30159	1.96036
109	109	84.6455	75	28.9116	0.43430	0.22263	0.36244	1.98679
110	110	75.9737	75	31.6160	0.84298	0.58737	0.70472	0.36788
111	111	76.2991	75	32.1160	0.91441	0.61515	0.62436	0.86788
112	112	90.1112	75	37.1796	0.71263	0.24232	0.14110	0.25102
113	113	85.8445	75	37.1160	0.77155	0.39293	0.32566	-0.13212

114	114	77.7230	75	33.6818	0.76347	0.61257	0.44858	0.15244
115	115	69.1309	75	30.5580	1.02863	0.83535	0.35980	-0.06606

Appendix C

Ranking Systems						
Obs	**Player**	**Overall Rank**	**Fairway Rank**	**GIR Rank**	**U/D Rank**	**Putts Rank**
1	115	1	1	2	37	13
2	27	2	7	7	1	3
3	20	3	8	1	13	58
4	85	4	3	17	7	7
5	54	5	41	3	57	31
6	11	6	20	18	3	6
7	58	7	18	8	12	27
8	41	8	11	14	5	11
9	10	9	10	63	10	1
10	96	10	9	15	17	34
11	110	11	19	27	2	24
12	80	12	58	26	15	28
13	71	13	15	9	11	48
14	14	14	108	12	44	43
15	18	15	96	33	4	19
16	111	16	12	16	6	33
17	43	17	55	4	14	98
18	33	18	57	6	40	67
19	67	19	82	10	36	63
20	49	20	22	45	30	21
21	114	21	44	21	21	55
22	97	22	103	51	26	16
23	86	23	13	5	85	69
24	55	24	25	60	9	18
25	101	25	72	25	39	53
26	61	26	49	65	22	14
27	105	27	90	37	18	17
28	82	28	40	30	97	49
29	87	29	26	28	27	61
30	24	30	83	38	31	29
31	92	31	2	87	65	9
32	17	32	104	20	53	70
33	40	33	61	34	35	37
34	98	34	29	66	23	15
35	81	35	100	58	101	12
36	16	36	64	31	74	51
37	62	37	105	89	16	4
38	30	38	37	74	24	23
39	76	39	63	64	42	10
40	50	40	102	75	20	20
41	5	41	59	22	103	91
42	28	42	71	70	8	40
43	39	43	27	56	41	57
44	93	44	32	11	115	90
45	70	45	42	39	70	26
46	77	46	48	77	49	35
47	52	47	67	24	77	93
48	1	48	28	23	80	95
49	8	49	16	36	98	80
50	21	50	46	42	33	72
51	59	51	53	40	78	64
52	104	52	4	49	62	76
53	13	53	80	35	68	74
54	91	54	73	32	55	59
55	26	55	23	29	82	86
56	19	56	85	81	25	32

57	51	57	66	71	67	42
58	46	58	101	57	51	46
59	60	59	91	19	38	106
60	90	60	106	47	43	52
61	88	61	34	50	107	78
62	99	62	112	67	32	36
63	22	63	75	48	60	60
64	25	64	5	108	54	8
65	102	65	92	73	59	44
66	4	66	76	114	45	2
67	56	67	84	44	29	81
68	84	68	107	13	110	104
69	107	69	43	62	64	71
70	83	70	14	84	46	65
71	36	71	6	54	61	88
72	2	72	78	59	109	79
73	31	73	111	79	86	56
74	53	74	109	86	19	62
75	34	75	79	92	99	38
76	47	76	24	41	114	100
77	103	77	62	53	50	83
78	32	78	88	83	75	45
79	45	79	52	52	47	107
80	100	80	99	91	111	54
81	64	81	56	61	94	94
82	109	82	113	110	34	5
83	48	83	94	55	66	101
84	95	84	35	113	76	22
85	106	85	93	99	56	25
86	78	86	74	88	95	75
87	35	87	33	85	93	77
88	72	88	114	46	92	105
89	3	89	81	76	83	87
90	74	90	36	111	89	30
91	65	91	89	43	79	110
92	69	92	110	102	73	47
93	113	93	39	82	48	102
94	57	94	86	100	72	66
95	6	95	115	94	91	68
96	89	96	68	69	69	109
97	66	97	69	112	52	39
98	75	98	65	107	28	41
99	38	99	21	93	87	82
100	29	100	87	96	63	50
101	79	101	17	80	84	99
102	9	102	70	78	96	92
103	23	103	98	101	104	84
104	68	104	30	72	71	111
105	44	105	45	104	81	85
106	63	106	50	68	106	114
107	37	107	51	95	108	96
108	12	108	97	105	88	97
109	15	109	47	90	100	115
110	112	110	60	106	105	103
111	73	111	54	97	90	108
112	94	112	38	115	113	73
113	108	113	31	109	58	89
114	42	114	77	103	102	112
115	7	115	95	98	112	113

Work Cited

"AJGA Tournament Cost." AJGA. Web. 18 Mar. 2018.

"NCAA." Of, Consolidated Financial Statements As, And For The Years Ended August 31, 2017, And 2016 Supplementary Information, and For The Year Ended August 31, 2017. National Collegiate Athletic Association and Subsidiaries: National Collegiate Athletic Association. Web. 18 Mar. 2018.

"Peggy Kirk Bell Girls Golf Tour Tournaments." Peggy Kirk Bell Girls' Golf Tour. Web. 18 Mar. 2018.